

Appl. No. 10/766,831
Amtd. dated Aug. 22, 2005
Reply to Office action of May 20, 2005
Atty. Docket No. AP999US

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently amended) Optical apparatus and a light delivery system for supplying said light to an input port of the apparatus such that the light illuminates a predetermined image plane within the apparatus,

said light delivery system comprising a lightguide for conveying said light from a light source unit to said input port, the lightguide having an inlet end for connection to an output port of the light source unit and an outlet end for coupling to the input port of the apparatus so as to provide substantially uniform light at said predetermined image plane,

there being imaging means at or adjacent the outlet end of the lightguide for imaging said outlet end of said lightguide at said predetermined image plane and displacing images of imaging non-uniformities present at or adjacent the outlet end of the lightguide away from said predetermined image plane.

2. (Currently amended) Optical apparatus and a light delivery system according to claim 1, wherein the imaging means for displacing images of non-uniformities away from said predetermined plane comprises a lens means between the apparatus input port and said outlet end of the lightguide.

3. (Currently amended) Optical apparatus and a light delivery system according to claim 1, wherein the imaging means for displacing images of non-uniformities away from the predetermined plane comprises a lens formed as an integral part of the outlet end of the lightguide.

4. (Currently amended) Optical apparatus and a light delivery system according to claim 2, wherein the lens is a negative lens.

5. (Currently amended) Optical apparatus and a light delivery system according to claim 2, wherein the lens is a positive lens.

6. (Currently amended) Optical apparatus and a light delivery system according to claim 3, wherein the lens is a negative lens.

7. (Currently amended) Optical apparatus and a light delivery system according to claim 3, wherein the lens is a positive lens.

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8. (Currently amended) Optical apparatus and a light delivery system according to claim 1, wherein the lightguide is a liquid lightguide comprising a sheath containing a light transmissive liquid, the sheath being sealed at said inlet end and said outlet end by first and second light transmissive sealing members, respectively, there being a liquid/sealing member interface between the liquid and at least the second light transmissive member.
9. (Currently amended) Optical apparatus and a light delivery system according to claim 8, wherein the imaging means for displacing images of non-uniformities away from the predetermined plane comprises a portion of the sealing member that is configured so that the interface is positioned in relatively close proximity to the outer end face of the guide.
10. (Currently amended) Optical apparatus and a light delivery system according to claim 9, wherein the sealing member is hollow, being closed at its outer end to form an end wall having an inner surface, the interface being at the inner surface of the end wall.
11. (Currently amended) Optical apparatus and a light delivery system according to claim 10, wherein the sheath fits around the sealing member.
12. (Currently amended) Optical apparatus and a light delivery system according to claim 8, further comprising a pressure gasket surrounding the external wall of the sheath adjacent the sealing member to clamp the sheath to the sealing member.
13. (Currently amended) Optical apparatus and a light delivery system according to claim 12, wherein the pressure gasket is an O-ring.
14. (Currently amended) Optical apparatus and a light delivery system according to claim 10, wherein the sealing member fits around the external surface of the sheath.
15. (Currently amended) Optical apparatus and a light delivery system according to claim 8, wherein the sealing member is a glass rod.
16. (Currently amended) Optical apparatus and a light delivery system according to claim 1, wherein the lightguide comprises a fiberbundle.
17. (Currently amended) Optical apparatus and a light delivery system according to claim 16,

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wherein the fiberbundle has a fused end portion and a transparent rod having one end connected to one end of the fused end portion, the distal end of the rod being the outlet end of the lightguide.

18. (Currently amended) Optical apparatus and a light delivery system according to claim [[17]] 16, wherein the imaging means ~~for displacing images of non-uniformities away from the predetermined plane~~ comprises [[a]] lens means between the apparatus input port and said outlet end of the lightguide.

19. (Currently amended) Optical apparatus and a light delivery system according to claim [[18]] 17, wherein the imaging means ~~for displacing images of non-uniformities away from the predetermined plane~~ comprises [[a]] lens ~~formed as an~~ means [[an]] integral with said rod, ~~part of the outlet end of the rod~~.

20. (Currently amended) Optical apparatus and a light delivery system according to claim 18, wherein the lens is a negative lens.

21. (Currently amended) Optical apparatus and a light delivery system according to claim 18, wherein the lens is a positive lens.

22. (Currently amended) Optical apparatus and a light delivery system according to claim 1, wherein the apparatus comprises a fluorescent microscope and wherein the lightguide end is placed at the focal point of a set of collector lenses such that the light that illuminates [[a]] said predetermined image plane within the apparatus is collimated, ~~set at infinity by placing the lightguide at the focal point of a set of collector lenses~~.

23. (Currently amended) Optical apparatus and a light delivery system according to claim 1, further comprising an adapter means for coupling said outlet end of the lightguide to said input port at a predetermined position.

24. (Currently amended) Optical apparatus and a light delivery system according to claim 23, wherein the adapter means comprises collector lens means, means for positioning the outlet end of the lightguide at a focal plane of the collector lens means at an input side thereof and means for coupling the opposite side of the collector lens means optically to the input port.

25. (Currently amended) Optical apparatus and a light delivery system according to claim 24,

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wherein the imaging means for ~~displacing~~ comprises a lens means between the lightguide and the collector optics.

26. (Currently amended) A light delivery system for supplying light to an input port of an optical apparatus such that the light illuminates a predetermined image plane within the apparatus, said light delivery system comprising a light source unit for supplying said light, a lightguide for conveying said light from the light source unit to said input port; the lightguide having an inlet end connected to an output port of the light source unit and an outlet end ~~coupled~~ for coupling to the input port of the apparatus so as to provide substantially uniform light at said predetermined image plane,

there being imaging means at or adjacent the outlet end of the lightguide for imaging said outlet end of said lightguide at said predetermined image plane and displacing images of imaging non-uniformities present at or adjacent the outlet end of the lightguide away from said predetermined image plane.

27. (Currently amended) A light delivery system according to claim 26, wherein the imaging means for ~~displacing~~ comprises a lens means.

28. (Currently amended) A lightguide for connecting a light source unit to an optical apparatus ~~according to claim 1~~, so as to supply light to an input port of the apparatus that illuminates a predetermined image plane within the apparatus,

the lightguide having an inlet end for connection to ~~[[the]]~~ an output port of a light source unit and an outlet end for connection to the input port of the apparatus,

there being means at or adjacent the outlet end of the lightguide for imaging said outlet end of said lightguide at said predetermined image plane and displacing images of imaging non-uniformities present at or adjacent the outlet end of the lightguide away from said predetermined image plane.

29. (Currently amended) A lightguide according to claim 28, wherein the imaging means for ~~displacing~~ comprises a lens means.

30. (Currently amended) An adaptor unit for interfacing light from a lightguide of a light delivery system to an input port of ~~[[the]]~~ optical apparatus ~~of claim 1~~ such that the light illuminates a predetermined image plane within the apparatus,

the adaptor unit having an output port for connection to said optical apparatus and an input port for connection to the outlet end of the lightguide and comprising optical elements for providing

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substantially uniform light at said predetermined image plane, there being means at or adjacent the input port of the adaptor for imaging said outlet end of said lightguide at said predetermined image plane and displacing images of imaging non-uniformities present at or adjacent the outlet end of the lightguide away from said predetermined image plane.

31. (Currently amended) An adapter unit according to claim 30, wherein the imaging means for displacing comprises a lens means.

32. (New) Optical apparatus and light delivery system according to claim 1, wherein the apparatus comprises a microscope having illumination optics and an objective and said predetermined image plane comprises an image conjugate plane of said objective,

said imaging means imaging said outlet end of said lightguide at said image conjugate plane and imaging non-uniformities present at or adjacent the outlet end of the lightguide away from said image conjugate plane.

33. (New) Optical apparatus and light delivery system according to claim 32, wherein the imaging means comprises a negative lens.

34. (New) Optical apparatus and light delivery system according to claim 32, wherein the imaging means comprises a positive lens.

35. (New) Optical apparatus and light delivery system according to claim 32, wherein the imaging means comprises a negative lens.

36. (New) Optical apparatus and light delivery system according to claim 32, wherein the imaging means comprises a positive lens.

37. (New) A lightguide according to claim 29, wherein the lens means is integral with the outlet end of the lightguide.

38. (New) A lightguide according to claim 29, wherein the lens means is integral with a rod at the outlet end of the lightguide.

39. (New) Optical apparatus and a light delivery system according to claim 15, wherein the imaging means comprises lens means integral with said sealing rod.

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40. (New) Optical apparatus and a light delivery system according to claim 1, wherein the apparatus comprises a microscope and wherein the outlet end of the lightguide is so positioned relative to a focal point of a set of collector lenses that the light that illuminates said predetermined image plane is not collimated.